# AGRICULTURAL NEWS LETTER

VOL. 21-NO. 6 NOVEMBER-DECEMBER, 1953

This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

DU PONT

REG. U. S. PAT. OFF.

ISSUED BY PUBLIC RELATIONS DEPARTMENT, E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DEL.

# AGRICULTURAL NEWS LETTER

Published bi-monthly by the
Extension Division, Public Relations Department

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Wilmington 98, Delaware

L. F. LIVINGSTON, *Manager*

R. M. ROBERTS, *Editor*

## DU PONT AGRICULTURAL ADVISORY BOARD



---

The AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and new ideas in the field of agriculture, particularly as they are related to advancements through research. Material appearing herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

This publication is available on microfilm. Beginning with Volume 17 (1949), it may be obtained in this form from University Microfilms, 313 North First Street, Ann Arbor, Michigan. The cost is $1.50 per volume, plus 10 cents for packing and mailing. All orders should be sent to Ann Arbor.

WHAT FARM EDITORS ARE SAYING --

"In today's game of supplying the consumer, the only person who can enforce the rule of 'take it or leave it' is the consumer himself. It was not always thus, and it may not always be thus, but today it is." -- E. B. Weinand in WESTERN FRUIT GROWER

"Research with crops and soil fertility to produce higher yields and quality; the use of chemicals to control insects and weeds; more and improved irrigation; farm mechanization; crop drying; improved livestock feeding and disease control will be necessary if we are to grow enough food for the future, to say nothing of exports for other hungry people abroad." -- COLORADO RANCHER AND FARMER

"We seem to be realizing that the independence which comes with exercising our privileges is vastly more satisfying than the feeling of dependent security when we demand our rights." -- Gordon Monfort in FARM MANAGEMENT

"A small farmer growing cotton is up against a difficult situation. He doesn't have the acreage to justify the equipment needed to protect the crop from insects. Perhaps the answer is custom dusting and spraying. Another possibility -- get a spray outfit that can be used not only for cotton, but to spray livestock and orchards." -- Eugene Butler in PROGRESSIVE FARMER

"The man who has faith and courage, and who is not so constituted that he feels he must follow the practices of the majority, has a great many reasons to believe that the beef-cattle business is sound, that its product will continue to increase in popularity, and that over the long pull, it is a dynamic field in which there are fine profits to be made by the man who will devote himself to the job and stay with it regardless of the momentary direction of the market." -- Don Ornduff in THE AMERICAN HEREFORD JOURNAL

"Freedom of the press is a priceless heritage we would all fight to preserve. But that freedom also carries a sacred responsibility along with it -- the responsibility of having the facts on both sides of a question before expressing an opinion on important subjects." -- by M. G. Mann, Jr., in CAROLINA CO-OPERATOR

"I suppose I am prejudiced, but to me the difference between country and big city is the difference between living or just stayin'."
-- Ed Eastman in AMERICAN AGRICULTURIST

*IN THIS ISSUE*

NYLON TARPAULINS COMBINING

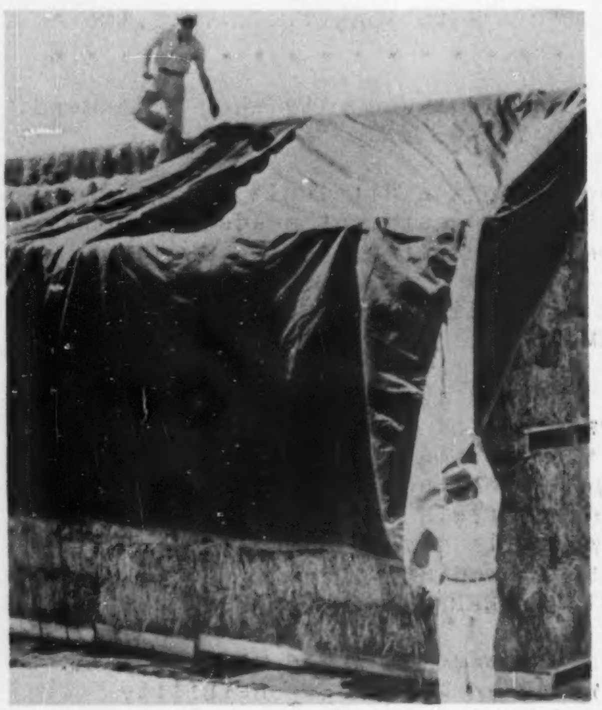
LIGHT WEIGHT AND LONG LIFE

Ever cover a pile of baled hay with a tarpaulin? Especially a wet tarpaulin?

Handling tarps, whether they are big ones to cover hay stored outdoors or smaller ones to protect tractors and implements during the rainy season, is a chore that has been lightened considerably through the use of nylon in their construction.

Nylon tarps are not only 50 per cent lighter for the same tarpaulin area, but offer the same qualities of long wear and tough construction which has made this man-made fiber popular in the garment trade.

One of the big headaches with tarps used out of doors is the weakening of the fabric by rot and mildew, due to exposure to wet weather. Once weakened by these causes, ordinary tarps rip easily when caught on corners of wooden platforms, or protruding ends of wire bale ties. Since nylon is not affected by the tiny organisms causing rot and mildew, its strength and durability are not impaired.



*Protecting baled hay with an easy-to-handle nylon tarpaulin*

Stockyards first started using nylon tarps to protect their baled hay several years ago. These users have estimated that nylon has increased the life of their tarpaulins by three to five times.

Today, nylon tarps are available in many sizes and are being used in a number of farm operations where their lightweight protection and increased strength and durability are of value. Readers desiring names and addresses of manufacturers of nylon tarpaulins may obtain them by writing to AGRICULTURAL NEWS LETTER, Du Pont Company, Wilmington 98, Delaware.

## VIEWING BUSINESS IN A WORLD AT PEACE!

Farmers are asking a lot of questions about the future of business these days. Will the imminent period of "cold peace" be as productive of good markets and good prices for farm crops, they want to know, as the past several years of both the "cold war" and the "shooting war"?

Assurance that "business isn't scared by peace" was voiced by Crawford H. Greenewalt, president of the Du Pont Company, in a recent "guest column" for the financial pages of the Philadelphia Inquirer. In part, Mr. Greenewalt said:

"After World War II there were grave warnings that the bottom would drop out of things with the end of war business. What these forecasters failed to recognize was the dynamic nature of our economy. They had assumed that we would go back to prewar standards, with "normal" demand established at prewar levels, whereas actually business went ahead with new plants and new products to meet new consumer demand -- all unrelated to earlier experience.

"In recent months we have seen a new outbreak of gloomy forecasts, based on the economic effect of peace in Korea. Underlying much of it is the fear that business will face hard going, once the prop of an active defense program is withdrawn. It has even been tagged in the financial headlines as a "peace scare," with solemn warnings that government must continue its spending program lest the economy collapse.

"If we are to believe that business will suffer through peace, then we must believe that business gains through war. Nothing, of course, could be further removed from the fact. War is a calamity to business as it is to the nation generally. To look only at the financial side, war is terrifyingly expensive and the share of its cost borne by business is very substantial. Since the Korean war began, for example, the Du Pont Company's average return on its investment has fallen off nearly one-quarter below the average of the three preceding years. This roughly parallels the experience of World War II when earnings dropped 21 per cent below prewar levels. The future is mortgaged: research and development are delayed and interrupted; personnel is diverted from creative pursuits to the taut necessities of the moment. Clearly, those who see war as a business blessing have no talent for simple arithmetic.

"Business isn't scared by peace. It is scared by the intimation that peace can have undesirable economic consequences. It is aghast, also, at the belief that government should step in and create an artificial demand for goods to keep things going. Business has far more to gain from a drop in government spending than it has to lose.

"At present, according to figures I have seen, we are

turning out a gross national product of about $360 billions a year. Some 50 billions, or about 14 per cent, represent government purchases. But the government program rides piggy-back; a very large portion of its cost comes out of wages and salaries and dividends and corporate earnings, which if unburdened, would flow into the normal channels of trade. It would be spent for additional consumer goods. It would be available for investment in new enterprise. It would bring about lower prices which would themselves stimulate demand. These are the creative methods through which our business and industrial system progresses.

"There is, in my opinion, no more reason to credit current pessimism than there was to take to the woods in 1945. Any assumption that business is unequal to the tasks of peace does a disservice equal to a charge that it is unequal to the task of war. The record would indicate, I submit, that it is fully equal to both.

"And in the cries of the pessimist I see a further danger. In this country our standard of living is such that a substantial part of our income is available for purchases that we may make today or put off until tomorrow. If we are confident of the future we buy today. If we are not, we decide to make the old car do another year, to delay our house painting until spring or, if we are up to it, to tell our wives that they can't have that new coat after all.

"Such decisions in the American home determine our relative state of business prosperity. They have an impact far outweighing the sober deliberations of Senators and statesmen. And because people react with great sensitivity to signs and portents, those who predict in public take on a great responsibility.

"I would therefore urge that we think twice before we sell the future short. The surest way I know to start a depression is to predict ourselves into one. The surest way to harvest those new products, whose seeds are sprouting in our laboratories, is to keep our hopes high, our incentives strong and our economy dynamic."

##########

## NYLON AND FRUIT JUICES

Press and filter cloths of nylon are being adopted by the food processing industry because of notable advantages in the handling of fruits and vegetables. When used as press cloths, nylon fabrics do not swell when wet, nor soak up juices. They also resist degradation by mildew and organic acids of fruit. Other advantages claimed for them include high tensile and bursting strength, light weight, long life, and minimum shrinkage.

## NEW STUDY PLAN FOR TEACHING SEED TREATMENT

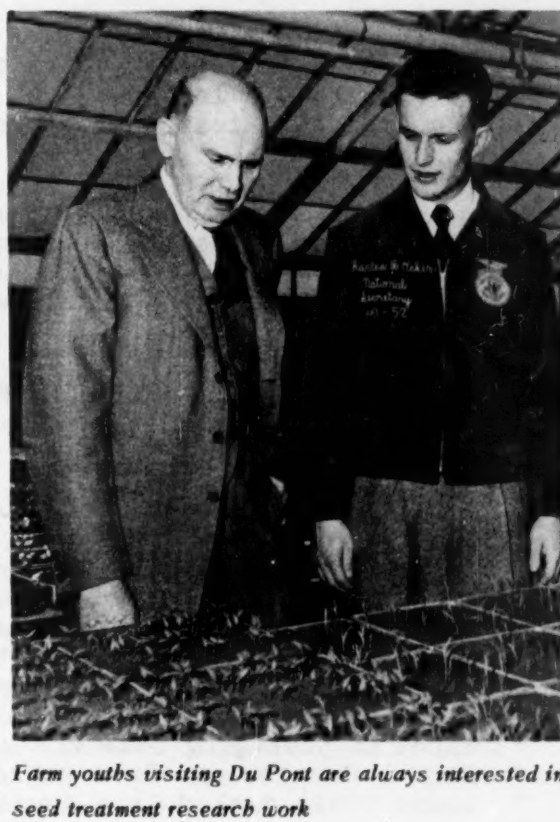
by L. L. Stirland
Seed Disinfectant Specialist
E. I. du Pont de Nemours & Co., Inc.

Some basic farm practices lend themselves to that most dynamic form of teaching -- the do-it-yourself demonstration. Chemical treatment of seed is a good example. It's a simple operation, requiring little equipment.

A new study outline tells how to set up a seed treating demonstration in the vo-ag classroom, or at 4-H club meetings. It begins with the construction of a simple seed flat. A school workshop can turn them out easily -- or each boy can make his own at home. Then comes the treatment of the seed itself, and planting measured amounts of treated and untreated seed in flats filled with soil right off the home farm.

Comparison of the "crop" and actual counting of seedlings from treated and untreated seed shows how chemical treatment improves stands by protecting the seed against both soil-borne and seed-borne diseases. Averages for a dozen or more pairs of flats under average test conditions usually show about one third more plants in treated flats than in untreated.

The outline also gives suggestions for field experiences -- trips to a seed treating plant, and interviews with local farmers to learn the practical results of seed treatment. It also describes what's likely to happen in the field when seed is not treated. The boys are urged to look for these indications in crops at various seasons of the year. Untreated seed of row crops, for example, will show "skips" in the row, seedling blight, and damping off. Untreated grasses and legumes may show a poor "catch" or spotty stands. Untreated wheat, oats, barley and sorghums will usually show signs of smut at harvest time.



*Farm youths visiting Du Pont are always interested in seed treatment research work*

######

EDITOR'S NOTE: A project outline designed specifically for teachers and local 4-H club leaders, plus enough "Arasan" seed disinfectant to treat grass and legume seed for demonstrations may be obtained by writing the editor of AGRICULTURAL NEWS LETTER.

## SPECIAL CARE RECOMMENDED FOR "WINTERIZING" MODERN RADIATORS

If you haven't put that anti-freeze in the radiator of the family car, pick-up, and tractor, it will be worth while observing some precautions pointed out by Du Pont Company experts on car cooling systems.

To cool modern, hotter-running motors, they point out, radiator cores contain tubes or passages that are smaller in diameter and have thinner walls than those of a few years back. This means that they are more subject to clogging with rust and scale.

For this reason, authorities advise cleaning out the radiator with a good cleansing agent, so deposits will not accumulate to slow down circulation of the anti-freeze, and ultimately lead to clogging and motor overheating.

Also, even though the radiator seems water-tight, a sealer may be poured in before adding the anti-freeze. This is good insurance in case a leak develops later. Freeze plugs may corrode in time and develop leaks. A properly formulated sealer will prevent this.

Another good precaution before introducing the anti-freeze to the cooling system is a thorough check of hose clamps, heater and heater hose, fan belt, thermostat, and pressure radiator cap. Clamps should be tightened and any defective hoses or other equipment repaired or replaced.

#########

### PLASTIC FILM LINERS FOR FRUIT BOXES

Use of packaging films as inner liners for boxes of pears and apples can lengthen the marketing season for certain varieties, it was reported at the recent annual meeting of the Produce Prepackaging Association.

Packaging specialists of the USDA reported that many types of packaging film are satisfactory for use with Bartlett, Anjou, Comice, and Bosc pears. They recommended that only sound fruit washed in a fungicide and to be kept for late storage be packaged in film-lined boxes. Pears sealed in film at 31° F. can be stored one or two months longer than fruit packed as usual, and still ripen with excellent quality, it was stated. Golden Delicious apples, which lose moisture easily and shrivel, benefit most from box liners of films impervious to moisture, such as polyethylene.

A New Herbicide

# PHENYLDIMETHYLUREA

by S. S. Sharp, M. C. Swingle, G. L. McCall,
M. B. Weed, and L. E. Cowart
E. I. du Pont de Nemours & Co., Inc.

Field tests by Du Pont personnel in a number of states have shown 3-phenyl-1,1-dimethylurea to be a herbicide specifically promising for the control of deep-rooted perennial weeds. The requirements for such a chemical for use in croplands is that it will kill deep-rooted perennials, yet be reduced to innocuous levels in the soil in a reasonable period of time.

Phenyldimethylurea is a white, crystalline compound having a melting point of 127°-129°C. It is sparingly soluble in hydrocarbon solvents and is soluble in water at 24°C to the extent of 0.29 per cent. Acute oral toxicity determinations on white rats reveal an approximate lethal dose (ALD) of 7500 mg./kg. The inclusion of phenyldimethylurea in the diet to the extent of .05 per cent for 90 days had no apparent adverse effect on white rats.

## Field Test Results

Field bindweed is one of the most serious noxious weeds of the central U. S. Field tests on this weed treated at various times of the year have been encouraging. For example, at Manhattan, Kansas, plots heavily infested with bindweed were sprayed in June 1950 with 25, 100, and 400 pounds per acre of phenyldimethylurea. The formulation used was an 80 per cent water dispersible powder. Observations the following year showed good bindweed control at the two higher rates. Two years later, the 25 and 100 pound per acre plots were completely covered with vegetation other than bindweed, while the land receiving the 400 pound per acre treatment was 50 per cent covered.

The observations in Table I were made ten months after a treatment applied in October on bindweed plots at Manhattan, Kansas. Two years after treatment, bindweed had reappeared in these plots where less than 80 pounds per acre was applied.

## California Tests

Control of bindweed was also tested in plots established near Stockton, California, in March. Rates of 10, 20, 40, and 80 pounds per acre of phenyldimethylurea were used. Three and five months after treatment the bindweed was present but stunted in the 10-40 pound per acre plots, but had disappeared from the 80 pound per acre plots.

Kansas and California tests show phenyldimethylurea to be of promise also for quack grass control. Quack grass infested plots

near Manhattan sprayed in November with 10, 20, 30 and 40 pounds per acre of phenyldimethylurea were inspected the following May. A 50 per cent kill was observed in plots receiving 10 pounds per acre, while 98, 99 and 100 percent control resulted in the 20, 30 and 40 pounds per acre treatments, respectively. The presence of crabgrass on all plots indicated the movement of the phenyldimethylurea from the surface layer.

In another test made at Garden City, Kansas in September, 20, 40, 60 and 80 pounds per acre of phenyldimethylurea were applied to quack grass. Control with the two higher rates was 99-100 per cent. On a silty clay loam with high organic content in Russell County, Kansas 40, 60 and 80 pounds per acre applications of phenyldimethylurea eliminated quack grass.

## Controls Johnson Grass

Good control of quack grass growing on a clay loam soil at Tulelake, California, was obtained with 80 pounds per acre of phenyldimethylurea. Partial kill resulted from the 40 pound per acre treatment.

Experiments on Johnson grass in Kansas, Louisiana, and Texas indicate the potential value of phenyldimethylurea in controlling this weed in cropland. Johnson grass plots in south Louisiana sprayed with 80 pounds per acre of phenyldimethylurea in September were 99 per cent free of this weed the following May. In plots sprayed in December control of Johnson grass with phenyldimethylurea five months later was as follows: 40 pounds per acre -- 45-50 per cent; 80 pounds per acre -- 95-100 per cent; 160 pounds per acre -- 100 per cent. In western Kansas and south Texas application of 80 pounds per acre of phenyldimethylurea gave good control of Johnson grass.

## On Bermuda Grass

Bermuda grass has been controlled by phenyldimethylurea. No Bermuda grass remained in plots at Garden City, Kansas 16 months after an April application of 60 pounds per acre of phenyldimethylurea. Bermuda grass was not eliminated by lower rates in this test. In Florida, an application of 30 pounds per acre had reduced the stand 80 per cent by the end of five months.

At San Juan, California, severe stunting, chlorosis, and leaf burn was evident on Canada thistles four months after spraying with phenyldimethylurea at rates of 25 pounds or more per acre. Rainfall during the test period totaled two to three inches.

## Soil Persistence

The soil persistence of phenyldimethylurea in the Kansas tests was studied by chemical analysis and bioassay procedures. The chemical analytical method was essentially the same as that described for CMU, 3-(p-chlorophenyl)-1,1-dimethylurea, by Lowen and

Baker* with the exception of the temperature and time of the coupling reaction used in the colorimetric determination of aniline, the hydrolysis product of phenyldimethylurea. Sixteen months after treatment, corn and sorghum grew normally in soil from plots receiving 25, 100, and 400 pounds per acre of phenyldimethylurea. Soybeans were injured only at the 400 pound level. Results of chemical analyses of soil samples from these plots 16 months after treatment appear in Table 2.

Samples from the Manhattan plots were taken about 10 months after an October treatment for bioassay and chemical determination of phenyldimethylurea residues. Corn, soybeans, and oats grew normally in soil taken from any depth (0-12") and at all dosage rates.

Similar chemical and bioassay determinations of phenyldimethylurea soil residues from tests in Florida, Delaware, Louisiana, and Texas follow the same general pattern revealed in the Kansas studies.

## Relation of Rainfall

Experiments were conducted in Florida and Texas to study the effect of time and amount of rainfall on phenyldimethylurea performance. Relatively low rates of phenyldimethylurea applied as pre-emergence treatments were used in order to get a rapid measure of the rain effect.

TABLE 1

Observations on vegetation in 100 sq. ft. plots sprayed with phenyldimethylurea at Manhattan, Kansas, ten months after an October treatment

| Pounds per acre phenyldimethylurea applied | Bindweed | Other Vegetation |
|---|---|---|
| 10 | Heavy growth | Heavy grass cover, predominantly crabgrass and purple top |
| 20 | 21 plants | 90 percent cover, primarily fox-tail and crabgrass |
| 40 | 3 plants | 90 percent cover, mostly crabgrass |
| 80 | 0 plants | 90 percent grass cover |
| 160 | 2 plants | 80 percent cover |

*Analytical Chemistry, Vol. 24, page 1475, 1952.

TABLE 2

Chemical analyses of soil 16 months after treatment with phenyldimethylurea at Manhattan, Kansas

| Pounds per acre phenyldimethylurea applied | Pounds per acre found at soil depth of 0-4" | 4-8" | 8-12" | Total |
|---|---|---|---|---|
| 25 | .03 | 0 | 0 | .03 |
| 100 | .07 | .03 | .5 | .60 |
| 400 | .3 | .44 | .57 | 1.31 |

The Florida test was concerned chiefly with the relation of time of rainfall to phenyldimethylurea activity. Duplicate sets of plots were used. In one set, two inches of water was applied from overhead irrigation immediately following herbicide treatment with one, two, four, and six pounds per acre of phenyldimethylurea. In the second set of plots, two inches of water was applied five days after herbicide treatment. When water was applied immediately after treatment, good weed control was obtained only at the higher rates. In the plot watered five days after treatment, initial control of weeds was obtained at all rates.

In Texas, the influence of time and amount of rainfall on phenyldimethylurea performance was studied using cotton as an indicator plant. Phenyldimethylurea was applied at rates of one and two pounds per acre as a pre-emergence treatment and water by overhead irrigation was applied at one, two, and four inches per acre immediately after the herbicide treatment. Two weeks later, the injury to cotton was moderate to extremely severe at all levels of water application.

In the second series of plots two inches of water was applied at three different times:

a) Immediately after treatment
b) One week after treatment
c) Two weeks after treatment

Injury to cotton from the phenyldimethylurea was more severe when water was applied immediately after chemical treatment. There was no effect on the cotton when no water was applied.

#########

EDITOR'S NOTE: The above discussion of phenyldimethylurea is taken from an article appearing in the September, 1953, issue of AGRICULTURAL CHEMICALS magazine. This new herbicidal material is being evaluated by state and federal experimental stations and is not at present available for farm use. We present this information only as an indication of what may be expected from this new product of Du Pont research.

# ERA OF ORGANIC CHEMICALS FOR FARMING IS CHALLENGE TO RESEARCH AND INDUSTRY

By Dr. Wallace E. Gordon
E. I. du Pont de Nemours & Co., Inc.

At the end of World War II, American agriculture crossed into the age of organic chemicals for the farm. Organic compounds like urea and alkyl mercurial fungicides had previously demonstrated their value to agriculture, but new pest control chemicals like DDT, 2,4-D, and other insecticides, fungicides, and weed killers have dramatized the new age. In 1939, farmers were spending about $20,000,000 per year for pest control chemicals. Now authoritative estimates agree that their expenditures run around $300,000,000 annually, a 15-fold increase.

It is clear that farmers will need more and better chemical tools to meet the production requirements of a growing population. Surplus problems come up temporarily with various crops and livestock products, just as they have this year with wheat. But a steady increase in demand for farm products is expected over the next few decades. This will demand a certain elasticity in the farm economy, so agriculture can meet the long-term demands without repeated economic stress or drastic and upsetting master plans. Chemicals, by offering large production increases for relatively small farm investment, help provide some of this elasticity.

## 50 Basic Chemicals

Dozens of manufacturers now produce a total of about 50 basic chemicals for agriculture that were not in commercial existence before World War II. These include insecticides, fungicides, weed killers, seed disinfectants, fertilizer materials, feed ingredients, and soil conditioners.

Historically, fertilizers were probably the first chemical ally of the farmer. And they are more important now than ever. During the decade of 1940-50, the quantity of fertilizer used on farms almost trebled. But only a small part of this increase can be attributed to new products or new practices. Most of the increased use of fertilizer results from more extensive use of established sources of nitrogen, phosphorus, and potash. Synthetic organic compounds represent only a small part of the total fertilizer supply.

In other applications of chemistry to agriculture, however, new organic compounds have improved on jobs already being done

by chemicals and have also brought new concepts of what chemicals can do for the farmer.

### Improved Job

As an example of an old job done better, the nation's fruit orchards and vegetable fields have been a major market for pest-control chemicals since the turn of the century when growers started using insecticides and fungicides based on inorganic compounds of arsenic, copper, and sulfur. Lead arsenate production reached a peak of over 90,000,000 pounds annually in 1944, and had dropped to 17,000,000 by 1952. This drop was far more than offset by increases in chlorinated hydrocarbon and organic phosphate insecticides, which were unknown commercially before the war. DDT production, for example, went from 9,626,000 pounds in 1944 to 98,773,000 pounds in 1952; and benzene hexachloride went from a little over 8,000,000 pounds in 1947 to 98,000,000 in 1952.

Copper sulfate for use in agricultural fungicides has remained steady at around 100,000,000 pounds per year while tonnage of sulfur has increased somewhat. The new dithiocarbamates and other organic fungicides have added several million pounds a year to the total volume of fungicides in use.

Even more dramatic are the new chemicals which represent new agricultural practices. Spraying grain fields and grassland for selective weed control has developed a market for 28,000,000 pounds of 2,4-D acid (1952 production) and still only a small proportion of the nation's 67,000,000 acres of wheat is sprayed. If a chemical can be developed for practical weed control in cotton fields, a large percentage of the annual 20 to 25 million acres will probably be treated.

### On Forage Crops

Even hayfields and pasture, which used to be the wastelands of the farm, are being treated with weed killers and insecticides. Conservative estimates figure 30,000,000 acres would profit from chemical treatment.

Then you think of 94,000,000 head of cattle, 55,000,000 hogs, 431,000,000 chickens, and all the other statistics which measure American farm resources, and the market for agricultural chemicals looks large -- whether you're talking about fertilizers, pest control chemicals for crops, weed killers, livestock insecticides, pre-harvest treatments, or growth-promoting chemicals for plants and animals.

Such chemicals appear to be essential tools for the future, when you realize that farmers will have to produce 25 per cent more food by 1975 without any substantial increases in U. S. cropland, and possibly with a smaller labor force.

### Risks in the Business

But in gauging the opportunities, the prospective manu-

facturer must also gauge the risks that accompany any farm chemicals venture. Some of these risks result from the seasonal nature of farm operations and the farmer's view of his economic prospects. Some have been created by technical and business competition among manufacturers, and some are unpredicted results of new chemical influences on "the balance of Nature".

Quick acceptance of new organic chemicals such as 2,4-D and DDT after the war has led to rapid expansion in national plant capacity. The hungry postwar markets welcomed the spectacular production increases that resulted when these new chemicals were put to use. Manufacturers saw an opportunity to multiply the value of such materials as benzene and chlorine substantially by converting them to farm chemicals. As a result, supplies increased manyfold, and extreme price competition developed, particularly in large volume insecticides and weed killers.

The use-season for farm chemicals is approximately one-quarter of the year, and neither farmers nor their local suppliers stock-pile much of the season's needs. This means that manufacturers must carry exceptionally large inventories -- as much as 40 per cent of annual sales, compared with three to ten per cent for industrial chemicals.

## "Bugs" Determine Business

Yet the movement of this inventory, of an insecticide for example, depends on the degree of insect infestation. With a weed killer, prolonged drought may either eliminate the need for it, or cut crop prospects so badly the farmer doesn't feel the crop is worth the investment.

In 1953, for example, cotton boll weevil infestation has been rather light for the third season in a row, so large inventories of cotton pesticides (DDT, BHC, etc.,) are on hand. A serious weevil infestation for the cotton crop would probably have used up all the carry-over of chemicals from 1952, plus a large part of national production during the first six months of 1953.

This kind of dilemma is commonplace in the pesticide business. The seasonal and economic factors are just as important for all other chemicals used in agriculture -- weed killers, feed supplements, seed treatments, fertilizers, etc.

## Rapid Obsolescence

Agricultural chemicals go out of date quickly -- particularly where one use represents a large proportion of the market.

For example, one of the first major farm uses for DDT was for fly control on dairy cows and around dairy buildings. Toxicological research showed that DDT tended to be absorbed through cows' skin and stored in butterfat so that it represented some degree of hazard to consumers. The Federal government then advised against

further use of DDT for dairy cows, and this resulted in an expanded market for low-toxicity insecticides like methoxychlor.

Furthermore, Nature's adjustment to new chemical influences adds another precarious note to agricultural chemicals. The acquired resistance of flies, mosquitoes, and Colorado potato beetles to DDT has cut into the market for that compound, and stimulated interest in other insecticides -- which in turn are not necessarily resistance-proof.

The obsolescence rate for agricultural insecticides seems to be much faster than for most industrial chemicals. This is another phenomenon of the organic age, since the almost infinite number of theoretical organic compounds has challenged research people, and stepped up the rate of experimental synthesis. By the time one new compound has become commercially established, several others may be ready to compete for the same market.

## Manufacturers' Responsibilities

Synthesizing a new compound is only the beginning. Testing it for agricultural use involves first of all a knowledge of agricultural problems which might be approached through chemistry. This means continuous contact with farm organizations, federal and state agricultural groups, state colleges, and various scientific institutions. Knowing the problems gives a good basis for setting up the screening processes by which promising new compounds are tested.

In Du Pont agricultural research, tests in the greenhouse and toxicological laboratory reject more than 90 per cent of the candidates. After success in the laboratory, comes the task of seeing whether or not a practical manufacturing process can be developed so that a chemical can be sold at a price in keeping with its value to the farmer.

The final step is to test new compounds for safety and effectiveness under natural conditions representing the different climates, plant and livestock varieties, management practices, and farm equipment found throughout the nation. Such tests may be conducted at company-owned farms throughout the country, or in cooperation with local state agricultural experiment stations or both.

The manufacturer's responsibility does not end when he has his product ready for market. The label recommendations must be registered with federal and state authorities, and field representatives, wholesalers, and dealers require information to tell farmers how to use the new material.

## Looking to the Future

In spite of the high risks and management problems in the agricultural chemicals business, there is a lot of satisfaction in it for both the businessman and the technical man, and there is every

reason to be optimistic about the future for agricultural chemicals in general.

The age of organic chemicals for the farm has put chemicals to work on jobs that were never done as well, or perhaps not done at all. And increasing mechanization means a greater challenge to chemistry. New harvesting machinery for cotton and soybeans generates interest in chemicals which will knock leaves off or dry up plants before harvest, so that mechanical speed and efficiency can be utilized for a high-grade crop.

Reaching the limits of our natural feed supply, livestock raisers and poultrymen are turning to chemical sources of nutrients -- not only vitamins and minerals but even synthetic amino acids and complete protein. Cattle and sheep, for example, can convert a simple nitrogen compound like urea into complete protein, through microorganisms which occur naturally in the rumen or first stomach.

## Specialized Jobs Cited

Other specific new jobs for specific compounds are developing -- like pre-emergence weed control with CMU in sugar cane and pineapple fields, and hayfield and pasture spraying with methoxychlor insecticide.

Conditioning the soil is one field where chemicals are just beginning to find a place. Experimental work has already paid off for gardeners and nurserymen, but costs of the chemicals have not yet come down to a practical level for general cropland use.

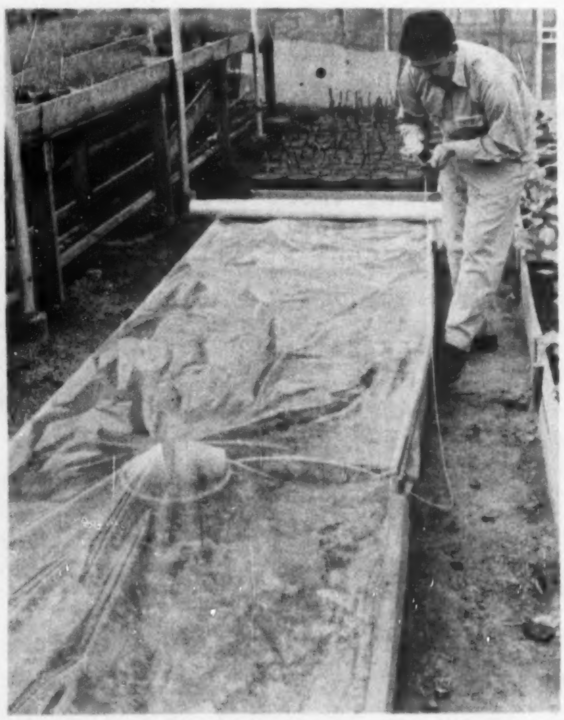
"Systemic" control of insects is another fascinating field. The U. S. Department of Agriculture has already announced successful experiments wherein they have injected insecticides into living plants and animals -- so that insects which feed on them die before causing any serious injury. Of course, there are many toxicological questions to be settled before a practice like this can become widespread, but the fact that it can be done at all offers a remarkable challenge to the technical man.

Meanwhile, research men are looking at fundamental problems too, and charting a course toward ultimate research goals. They are studying the chemistry of life processes themselves, in the hope that sometime compounds can be synthesized for specific purposes, and their performance predicted in advance. If ways can be found to predict biological activity of new compounds, years will be saved in the development of new chemicals for agriculture.

######

EDITOR'S NOTE -- The above discussion is condensed from an article in a recent issue of the New York JOURNAL OF COMMERCE.

*Polyethylene bags protect root bases of small plants or root cuttings to be handled or shipped.*



*When gas is used for treating plant beds, a polyethylene tarpaulin is handy and effective.*

## TRANSPARENT PLANT PROTECTION

Farmers and nurserymen who have problems in handling and shipping plants, or in caring for seedbeds, are discovering the many advantages of polyethylene film -- a modern protective material which is tough, waterproof, and can be used over and over again.

Polyethylene film is a product of chemical research which has found a secure place as a transparent packaging material, particularly in the field of fruit and vegetable packaging for modern super-market displays. Its advantages in the field of plant protection have only been recognized recently.

For the nurseryman who has plants of all sizes which must be shipped, or the farmer who wishes to move young trees or other sizable plants some distance, polyethylene film offers an insurance policy for the delicate root structure. Roots are firmly held in place, and at the same time the moisture content of the root ball is maintained. Rubber grafting bands, string, or plastic-coated wire ties can be used to secure the film to the plant. Expensive wooden or tin tubs, ordinarily used to transport plants, can be eliminated.

Since it is impervious to moisture, the film makes a fine mulch covering for seed beds and plants which must be protected against winter weather. Much easier to apply than burlap, straw, or other materials commonly used as mulches, the polyethylene may be simply layed down over the bed and its edges secured so gusts of wind will not move the sheet.

*Here six-year-old holly is wrapped to keep the root ball moist while the plant is being moved.*

*Waterproof, and unaffected by temperature changes, polyethylene is used as a winter mulch covering.*

When gas is used on seed beds as a fumigant, soil sterilant, or weed killer, a sheet of polyethylene film makes an effective tarpaulin. Resistance to chemicals of the types used for these operations makes the film ideal for this purpose.

Polyethylene film does not become brittle with age. The same sheet which is used for mulching a plant bed during the winter may serve as a gassing tarpaulin, and later as a wrap for the root-ball of a tree or shrub being moved or shipped. With a little care in handling, the same sheet of film may do duty for several seasons.

The film may be obtained in various thicknesses. For purposes discussed here, 200 to 400 gauge material is recommended. Whatever the gauge, the current price is 78 cents per pound. A pound of 200-gauge film will cover 104 square feet; a pound of 400-gauge covers 52 square feet.

Polyethylene is available in rolls, up to 56 inches wide, or in cut-to-size sheets. It may be secured through distributors of paper products, by contacting the local representative of Du Pont's Film Department, or by writing the Industrial Sales Division, Film Department, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware.

FUNGICIDE KNOCKS CANTALOUPE DISEASES

Downy mildew and powdery mildew, serious enemies of cantaloupe growers in the Rio Grande Valley of Texas, may be controlled with dusts or sprays containing "Manzate" fungicide, according to a recent bulletin from Texas A. & M. College. Dusts containing six to eight per cent "Manzate", or sprays of 1-1/2 pounds of "Manzate" per 100 gallons of water are prescribed.

## FUNGICIDE TEST

### Florida Tomato Growers Cooperate in Evaluating Manganese Sprays

Last year, outstanding results were obtained in tomato growing areas throughout the country, using a spray containing "Manzate" fungicide to control all five major tomato diseases -- early blight, late blight, anthracnose, gray leaf spot, and Septoria leaf spot.

Theoretically, a nabam product, such as "Parzate" liquid fungicide (disodium ethylene bis dithiocarbamate), could be combined in the spray tank with manganese sulfate to produce manganese ethylene bis dithiocarbamate, the active ingredient in "Manzate". So the question was raised as to whether this farm-mixed fungicide would give the same protection to the crop as the commercial preparation.

To explore this, tests were set up early this year by a Du Pont plant pathologist on five Florida farms in various tomato-growing sections. Growers offered a total of 37 acres for these tests, half of each plot being treated with "Manzate" fungicide and the other half with the tank-mix. Following are the results on each farm.

W. R. Goodwin Farm, Micco, Florida -- This is in the section just north of Fort Pierce. The areas treated with "Manzate" fungicide yielded 44.3 per cent more tomatoes per acre in three pickings than the tank-mix treated areas. Late blight was the principal disease present.

B & L Farms Co., Florida City, Florida -- Since no fungous disease occurred in these fields, there was no difference in yield which could be credited to either fungicide.

Pearce Produce Co., Immokalee, Florida -- Here again, no disease showed up, so no fungicide evaluation was possible.

R. R. Mims Farm, Fort Pierce, Florida -- On one end of the nine-acres used for tests on this farm, it was much wetter than in the rest of the field. In this damp area, late blight was most severe. Here, "Manzate" fungicide held the disease to an average of less than one blight spot per plant. In the same damp area, the tank-mix allowed an average of approximately 100 spots per plant. Since this blight-infested area was only a small percentage of the total test area, with virtually no disease in the rest of the field, yield differences were not pronounced. Areas treated with "Manzate" produced 3.2 per cent more fruit than the tank-mix areas.

Elsberry Farms, Ruskin, Florida -- Here, diseases were a decided threat and plants treated with "Manzate" yielded 30 per cent more tomatoes per acre in three pickings than tank-mix plots. At the time of the third picking, plants in tank-mix plots were

60 per cent defoliated due to early blight and gray leaf spot (Stemphylium). At the same time plants in areas where "Manzate" was sprayed were only 10 per cent defoliated. These were staked tomatoes and as much as six inches of bare stake showed above the tops of plants treated with tank-mix, while those treated with "Manzate" and given better protection against the stunting effects of plant disease had grown well above the stakes, hiding them entirely.

Three varieties of tomatoes were represented in these tests. These were Grothen's Special K, Rutgers, and Grothen's Globe.

Failure of the tank-mix to give proper protection when serious disease infestation occurred is seen as evidence of the importance of proper formulation of chemical products. Experts in chemical manufacturing processes have often pointed out that the mere presence of the proper chemical compound to do a specific job is not sufficient, if that chemical is not in a form which allows its application in a manner adapted to the work to be done.

In the case of fungicides and insecticides for plant protection, proper blending of the ingredients, addition of the right inert materials to carry the active chemical, and grinding the finished product to the right particle size to insure good coverage of the plant are built-in features of a reliable product which may spell the difference between outstanding performance and failure.

##########

## HARDWOOD POISONING WITH CORNELL TOOL STUDIED

Economical control of undesirable hardwood species which overtop pine seedlings in southern forest areas and farm woodlots can be accomplished through use of "Ammate" weed and brush killer administered with the Cornell tree poisoning tool, according to a recent note from the Southeastern Forest Experiment Station at Asheville, N. C.

The Cornell tool was designed to administer a measured dosage of chemical each time the point of the tool is jabbed into the tree trunk. In one test, 933 trees of five major hardwood species were treated in January 1952. In May, 1953, an examination showed only about 24 per cent of the treated trees still with live crowns, with many of these showing signs of foliage deterioration.

While kills up to 95 per cent are common using "Ammate" in low axe cuts, tests with the Cornell tool indicate that its use can result in a kill of 75 per cent or better, with lower labor costs per treated tree. "Ammate" is used in the tool at the rate of six pounds per gallon of water, making the cost of chemical less than a half-cent per tree. Prime advantage of chemical poisoning comes achieving root-kill as well as top-kill, thus controlling sprout growth.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

## E X P E R I M E N T E R S ' N O T A T I O N S

A Round-up of Data from Across the Nation

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Grape growers around Erie County, Pennsylvania, rely on DDT to control both grape berry moth and grape leaf hopper. But when DDT and Bordeaux mixture are applied, excessive foliage injury has been observed. At the same time, the Pennsylvania Agricultural Experiment Station reports, grapes treated with DDT and ferbam show little or no injury. Grapes treated with DDT and Bordeaux during the past two years yielded an average of 1.7 tons less fruit per acre than grapes treated with DDT and ferbam.

#####

Dusting of velvetbeans, soybeans and peanuts in southern states with dusts containing methoxychlor, DDT, or toxaphene to control velvetbean caterpillars is recommended by USDA investigators. The entomologists warn that DDT-treated crops should not be fed to dairy animals or beef cattle being finished for slaughter, and that 40 days must elapse after application before toxaphene-treated crops are safe for feeding. Because methoxychlor does not tend to be stored in tissues, or secreted in milk, no restrictions are placed on feeding crops treated with this material.

#####

"Chemotherapeutic action" of fungicides in the control of tobacco blue mold is claimed by Dr. Gordon S. Taylor, in charge of the tobacco laboratory of the Connecticut Agricultural Experiment Station. Dr. Taylor has conducted experiments using both zineb and ferbam (active ingredients in "Parzate" and "Fermate" fungicides, respectively) which indicate that these fungicides were absorbed by the plant rather than remaining on the surface of foliage. This evidence was seen when plants sprayed with the fungicides were washed off, then innoculated with the blue mold fungus. Treated plants were much more free of disease than those which had received no spray.

#####

Still on the fungicide front, several years of research by Dr. J. R. Kienholz, USDA plant pathologist at Hood River, Oregon, reveals that the inclusion of ziram in two or three sprays will control bullseye rot, a disease responsible for heavy storage losses of apples grown in the Pacific Northwest. Fungous spores which cause the disease are generated in cankers which develop in injured bark tissue on trees. Dr. Kienholz' recommendations can be followed by using a pound of "Zerlate" fungicide per 100 gallons of spray in the first two sprays for codling moth control, then $1\frac{1}{2}$ pounds of fungicide in the final spray of the season. If the early season is dry, the "Zerlate" can be eliminated from the second spray.

DU PONT

REG. U. S. PAT. OFF.

**Better Things for Better Living**

***. . . through Chemistry***

A-[illegible] PRINTED IN U. S. A.